paid to a proper regulation of the moisture of the atmosphere. In many cases exposure to direct sunlight must be avoided, as in the dense forests of America and Africa, or the jungles of India. direct light does not reach these plants, but they only receive it as reflected from and transmitted through the foliage of the trees.

Many orchidaceæ require also a very rich humus soil. That of the forests and swamps is very rich in decaying vegetable matter, and the nearer the soil in which they are to be raised approaches to that naturally selected by them the better they will develop. In France very good results have been obtained by planting the seeds or tubers in a stratum of half decomposed moss, species belonging to the genus Sphagnum being generally preferred on account of the large quantity of water which they are able to retain. This artificial soil must be well fertilized by guano, as it contains in itself little nourishment.

The duration of flowering, as well as the time at which it begins, varies greatly with the different species, and this circumstance is one of the principal reasons for the favor with which orchids are generally regarded. Odontoglossum, Aerides, Agrœcum, Vanda, Zygopetalum, Saccolabium, and others flower for periods extending from a few days to several weeks. On the other hand there are others that flower only for a single day.

The irregularity existing in this respect permits the artificial prolongation of the period of flowering of some species by the aid of another. Instances are related in which plants, which generally flower from one to two days only, were kept in bloom for some time by being fecundated with the pollen of another species flowering through a longer time. New varieties of great beauty have also been obtained in this manner.

The geographical distribution of the orchidaceæ is very extensive, hardly any portion of the globe being entirely devoid of them. They abound, however, principally in the hot zones, especially in America. During the past few years quite a number of interesting species have been discovered in Australia and on the islands of the Malayan Archipelago.

One of the most common orchids found throughout the temperate zone, on both hemispheres, the vanilla, belongs to the group Arethusea, the members of which belong exclusively to the tropical zones. Epidendrea are of American origin, it being questionable whether the few species found in Asia are indigenous there. All the other genera have members indigenous in all continents.

Excepting the pods of the vanilla plants the articles of commerce derived from the orchid family are of little importance. The tubers of Orchis Morio, Militaris, Mascula, Maculata, and other species, contain large quantities of mucilage and starch, and they were formerly largely used as an article of food. Dioscorides mentions this fact, stating that by drying the tubers lose their peculiar bitter taste. This is done to some extent at the present day, especially in Egypt, Nubia, and Abyssinia.

The tubers of orchids have, under the name of *salep*, been admitted into the reciparium of medicine, and are highly valued, in the form of mucilage, as an emollient and demulcent in inflammatory diseases of the stomach and bowels.

The root of cypripedium, or lady's slipper, is also officinal, and is used as a popular household remedy in nervous and epileptic affections, but it is probably inferior to valerian. *Ophrys nidus-avis* was formerly used as a vermifuge, but seems to be of little value. A decoction of *Neottia ovata* forms a good dressing for wounds, but has been replaced by other agents of more modern origin. Many other orchids are here and there used for gout, and other diseases, but with the exception of *Spiranthes diuretica*, which seems to be a good diuretic, none of them appear to be of special value.—*T. Poisson in La Nature.*

THE NEW YORK ACADEMY OF SCIENCES.

At a meeting of the Biological Section of the New York Academy of Sciences, on Monday evening, April 28th, the President, Dr. J. S. Newberry, occupied the evening with some interesting notes on the various

"DEVICES EMPLOYED IN NATURE FOR THE DISTRIBUTION OF SEEDS OF PLANTS."

The speaker remarked, in substance, that we find among plants a host of adaptations to enable them to overcome the many obstacles that they meet with on every side in their struggle for existence. In tropical countries, where plants are most highly favored, we find their vegetative parts highly developed; but as we ascend northward and approach the arctic regions, we find the energies of the plants more and more directed toward a greater increase of the reproductive parts; so in such latitudes arboreal vegetation becomes reduced to mere shrub-like plants, yet completely loaded down with a mass of flowers and fruit. The struggle for existence in this case is aided by redundancy of fruit, for at least 99 per cent of all the seeds produced by the flora of such regions must, through the nature of the surroundings, either perish or fail to germinate.

Plants being immovably fixed to the spot where they grow, must necessarily be provided with some way of distributing their seeds, in order to insure the perpetuation and extension of their species. As a large proportion of all the seeds that are produced must, through many causes, fail to germinate, many plants make provision against such an accident by yielding these in immense quantities. The tobacco plant, for instance, produces at least 350,000 seeds in each of its capsules, and thus. by this very redundancy, is enabled to overcome a thousand obstacles in the way of its propagation.

But coming directly to the subject to be especially considered, there is a class of devices employed by plants to effect the dispersion of their species over a wide extent of country, which are mechanical; and such devices are various and confined to no particular group of the vegetable kingdom.

The first method to be considered, and the one that is most conspicuous, is that of distribution by the wind, and we see the effort constantly being made by nature to spread seeds broadcast in this way. A large number of plants depend on this method for their wide dispersion, and their seeds are so constructed as to enable them to take every advantage of it. The extensive order of plants, the *Compositæ*, depends largely but not entirely on this means. In many of the genera of this order, the one-seeded capsules remaining on the disk after flowering are surmounted by a tuft of fine hairs called the "pappus," which is really the hair-like calyx of the florets. This being persistent and increasing in size as the fruit goes on maturing, forms a feathery sail to carry the seed far away through the air. The pappus varies in different genera, both in form and size; sometimes it consists of hairs, sometimes of feathers, and sometimes it is mounted on a stipe, so that it resembles a parachute. Familiar examples of this may be seen in the dandelion, thistle, etc.; and it is by such a means that is distributed the *Erechtites*, a composite plant, which, from its habit of springing up suddenly on recently burned-over timber lands, where it was before unknown, has acquired the name of "fire weed." This device is not confined to composite plants; we find examples of it likewise in the asclepiads or milkweeds, whose seeds are provided with long silken comose appendages, by means of which they are wafted to great distances by the wind. The fruit of the virgin's bower, too, is furnifhed with long plumose tails, like downy tufts, which serve a like purpose in the economy of the plant. Other familiar examples may be seen in the seeds of the cotton plant, dog's bane, etc.

Another mode of wind distribution is by means of what maybe called the "balloon." In many plants the seed vessels, during the progress of maturing their seeds, become greatly inflated and balloon-like; and when detached from the parent plant are readily carried through the air or rolled along the ground by the winds to considerable distances. We have familiar illustrations of this in our balloon-vine or *Cardiospermum*, which is very remarkable for its large, inflated membranous seed capsules; in the common "bladder-nut" of our woods; and in the "ground cherry" and Bougainvillea. The varieties of this sort of fruit found in nature are very numerous.

The dispersion of the seeds of still another great group of plants is effected through the aid of "wings." Appendages of this kind, both to seeds and seed capsules, are various. One of the more familiar forms is that known as the "samara," characteristic of such trees as the elm, maple, and ash. By means of their membranous, wing-like expansions (entire and circular in the elm, or two diverging "keys" in the maple) this form of fruit is enabled, when ripe, to go fluttering away through the air like bits of paper. A like device is found in the fruit of the conifers, nearly all the species of which are provided with seeds having their membranous wings.

A very large number of plants are distributed through the involuntary acts of man and the lower animals. To effect this, seeds and fruits have been provided with various kinds of appendages, and one of the commonest of these is "hooks." Familiar examples are to be seen in the involucres of the burdock, the outer surface of which is covered with scales terminating in hooks; in the "beggar's ticks" (*Bidens*), the achenia of which are two horned and adhere to every passer-by; in the clotweed, the burr of which is covered with stiff hooked prickles; and in the "hound's tongue" (*Cynoglossum*), the seeds of which are armed with hooked prickles. In the leguminous plant, *Desmodium*, the seed pod or loment is not only covered with minute prickles, making it adhesive, but it also breaks up at the constricted joints, so that the seeds have a greater chance of being still more widely scattered.

Another method of seed dispersion is by what may be termed "explosion." This, too, is exhibited under a good many different forms. One of the most curious of these had lately come under the speaker's observation, and suggested to him the subject of his present remarks. Some time ago a student had brought him from Cuba a specimen of the fruit of one of the *Euphorbiaceæ*, the "sand box" or *Hura crepitans*. This fruit is a hard and woody capsule, discoid in shape, something like a muskmelon, but very deeply ribbed, and about three inches in diameter. He laid the specimen on his writing table, and while reading the other evening he was suddenly startled by an explosion as loud as the report of a rifle, fragments of some material at the same time flying through the air to every part of the room. On examining these he found them to be the seeds and broken pieces of the sand box fruit. A study of one of these capsules shows it to be a marvel of ingenuity in the arrangement of its parts to accomplish seed dispersion. The rib-like processes are seen to consist of carpels placed parallel to a common central axis, and these on becoming dry open very suddenly with a loud detonation, the force being exerted by two strong woody springs, between which the lenticular seed is inclosed.

Other illustrations of seed expulsion by "explosion" are found in such plants as the balsams (*Impatiens*), the pods of which at a mere touch throw back their valves and eject the seeds with great violence; in the Mexican *Astragalus*, the vesicular pods of which explode when mature; in the g[illegible]an; in the common lupine, and in many other plants. In some of the cucurbits, too, we find force of this kind exerted in the expulsion of the seed, particularly in the squirting cucumber, the fruit of which when fully ripe throws out its juice and seeds with considerable force through an opening at its base. Many examples of this method of expelling their reproductive bodies are found also among cryptogams. In the liverwort (*Marchantia*) the minute spores are contained in globular capsules, and intermixed with spiral threads or *elaters*, by the untwisting of which they are ejected to some distance. In the "horse tails" (*Equiseta*) we find something analogous: the capsules of the plants are filled with minute spores, to each of which is attached (and wound spirally around it when moist) four club-shaped elastic appendages. These filaments are hygrometrical, and rapidly uncoil when they become dry and cause the spore to move about, and are admirably adapted to aid in the dissemination of the plants.

Many kinds of plants are distributed in still another way. Certain hard and indigestible seeds often accompany delicious and succulent fruits. The latter being eaten by man or the lower animals, the seeds pass through the alimentary canal unchanged and unharmed. By this means very many hard seeds, such as those of the dogwood (*Cornus*), etc., swallowed by birds, are often carried by them and deposited at a great distance from the place where they were produced.

Another method of seed distribution is by means of the "waves." A large number of tropical plants, whose seeds are so protected as to be unaffected by the action of water, are floated off to immense distances and deposited on the shores of foreign countries, where, if the conditions for it are favorable, they germinate. By this means the cocoanut has been transported from one country to another; and in this way the coral islands (which are of comparatively modern formation) have been stocked with this as well as with other tropical fruits. The well known sea beans, which grow on the river banks of Central America, are carried by the rivers to the ocean, and, transported by the waves of the latter, are often thrown on the coast of Norway.

Dr. Newberry then mentioned a method of seed dispersion common to one of our native trees, and which he stated he had never seen noticed in print. Our button-ball tree or scyamore (*Platanus*), although found in elevated places in the Eastern States, prefers the moist alluvial soil of bottom lands, and in such situations in the West grows luxuriantly and attains an immense size, the trunk sometimes reaching 10 to 12 feet in diameter. The seeds of this tree are produced in a "capitulum" or globular head attached to the branch by a stiff stem 4 or 5 inches long. In our common species these balls are solitary, but in a California species—the *Platanus racemosus*—three or four balls are borne on the same stem. These globular balls of seeds are persistent and hang upon the tree, on their long woody pedicels, throughout the winter. By the action of frost, and through the effect of alternate freezing and thawing, the woody pedicels become ultimately reduced to mere thin fibers, strong but exceedingly flexible. By the action of the winds of early spring the balls are beaten violently against the branches, and the seeds are thus detached and fall into the waters beneath. Now it so happens that all this takes place just at the season when freshets have caused the rivers to be at their highest, and as the waters afterward gradually subside the seeds are distributed far and wide over a large extent of country.

In conclusion, Dr. Newberry described and illustrated by a drawing on the blackboard the curious pods of a Western plant, the *Martynia proboscidea*, or devil's pod. This plant has large showy flowers, and its fruit consists of an oval fleshy pod terminating in a long rostrum or beak. The pods when mature are woody, and when ready to discharge their seeds the beak splits into two very rigid incurved horns abruptly bent at the ends into a very sharp grappling hook. This device is frequently utilized by the plant to effect its distribution, and the mule is made to act as the agent to accomplish it. When the animal steps on one of the pods (a matter of frequent occurrence) the pod opens, and the two rigid hooks clasp around his fetlock, and there remain until noticed by some person, for it is impossible for the mule to remove the pod by any effort of his own. In this way the devil's pod is often transported to great distances.

The speaker suggested that the devices employed by plants for the preservation of their seeds from injury would form an interesting topic for discussion, and hoped some one would bring the matter before the Academy in the form of a paper.

Wheeling as a Manufacturing City.

In a recent conversation reported in the *Tribune* of this city, Governor Matthews, of West Virginia, spoke of Wheeling as one of the chief iron making cities in the country. It turns out yearly more than one-third of all the nails made in the United States, and fully one-fifth of the annual production of the entire world.

Wheeling is also heavily interested in the manufacture of glass, which it ships everywhere —even to London. Brazil and Australia are among the best markets for its glass.

One feature of this industry is rather singular. Wheeling manufacturers make the beautiful glass chandeliers which have become so fashionable of late, but they import the cut-glass pendants from Switzerland, where the peasants make them by hand cheaper than they can be made by machinery in this country. Many of these chandeliers are sent to London, so the pendants make two voyages across the ocean.